Adaptive Laser Fabrication Deep Inside Narrow Bandgap Materials

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Volume fabrication deep inside semiconductor devices is important for numerous advanced applications from 3D integrated microelectronics/photonics to micro-electro-mechanical systems. Direct laser writing creates a promising alternative to other methods which can require tedious steps, but recent research shows severe difficulties specific to semiconductors. The narrow bandgaps and large nonlinear refractive indices cause strong limitations on the achievable focusing conditions, which in conjunction with important nonlinear propagation effects preventing the high space-time energy localization required for precise and controllable fabrications. In this research, we report our efforts to monitor and optimize the applied laser conditions inside semiconductors to achieve high spatial-temporal localization of laser energy. To circumvent plasma screening and other detrimental nonlinear propagation effects, we shaped the applied ultrafast pulses temporally or spatially, effectively improving the power and intensity localization in the focal region, thus paving the way for high-quality 3D fabrication deep inside narrow bandgap materials.

Short Bio:

Andong Wang received his Ph.D. degree in 2018 from Beijing Institute of Technology, with his research focusing on Laser Micro/Nano Fabrication. He investigated 3D laser processing inside silicon during his postdoc fellowship in the Laboratory of Laser Plasma and Photonics Processing, National Research Center of France from 2018 to 2022. Afterwards, he continued his research in Oxford University from 2022 to 2023, under the sponsorship of the Marie-Curie Fellowship. Now he returned to Beijing Institute of Technology as a professor. His interest focuses on laser micro/nano processing and its applications.